HEALTH CONSULTATION

DURAND MERCURY INCIDENT

DURAND, SHIAWASSEE COUNTY, MICHIGAN

Prepared by

Michigan Department of Community Health
Under a Cooperative Agreement with
Agency for Toxic Substance and Disease Registry

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Incident and Response

The Michigan Department of Community Health (MDCH) Toxics and Response Section received a phone call October 14, 2002 from a Durand High School counselor. She had learned from a student that the student and two of his friends had found and taken possession of several vials (5 or 6 vials at approximately 2 fluid ounces each) of elemental (liquid) mercury. The counselor was concerned that, since the student had had the vial in his backpack, the backpack and the locker it was stored in might have become contaminated. Two staff from MDCH and the Health Officer for the Shiawassee County Health Department (SCHD) met with the counselor and the student at the school. They interviewed the student and then checked the student's lockers, his friends' lockers, the student's homeroom, and the hallways with a Lumex mercury vapor analyzer.

The student said that he and two friends had found the vials while exploring a private junkyard (Photos 1 and 2). One student took a vial to his home; the other boys took the remaining vials with them to an abandoned van in a field near one of their homes (Photo 3). The boys reported playing with the mercury at the abandoned van and then leaving the mercury there. Upon returning the next day, the boys discovered the mercury was missing.

MDCH and SCHD staff proceeded to the residences of the students and tested their homes and clothing for mercury. In one of the student's homes, elevated mercury levels were detected from the drain of a bathroom sink and the household vacuum cleaner. MDCH staff assisted the homeowner in removing the drain trap and emptying its contents into a disposable container. Approximately one teaspoon of mercury was recovered from the sink trap. MDCH staff took the mercury for safe disposal and advised the homeowners to replace the trap. MDCH also recommended that the vacuum be discarded. No evidence of mercury contamination was found in the homes or belongings of the other two boys, which supports their earlier claims of having never taken the mercury to their homes.

MDCH and SCHD staff visited the abandoned van in search of the remaining mercury. Two empty vials were found in the van and several mercury droplets were scattered in the back of the vehicle (Photo 4) and on the adjacent two-track leading to the vehicle. Based on the small volume recovered in the sink trap of the first home and the small volume found splattered in the van and adjoining trail, MDCH and SCHD staff knew that the bulk of the original mercury volume was unaccounted for.

MDCH returned to Durand the next day to re-interview the boys involved in the incident and to meet again with SCHD environmental health representatives. They went to the school and spoke again to the boy whose home showed contamination. He continued to deny having brought mercury into his house and claimed instead that he had stored it outside. The other boy stayed with his story of having brought the remainder of the mercury to the abandoned vehicle in the field near his house accompanied by the third individual. MDCH and SCHD staff went to the impacted home and sampled indoor and outdoor locations on the property. They detected mercury vapor levels greater than 2,000

nanograms per cubic meter (ng/m^3) in two trash bags in a garbage can on the edge of the property but did not discover any other contaminated items. From there, the health officials went to the property where the mercury was initially found in the back of a junked commercial van. SCHD attempted to make contact with the owner of the property, and failing that, left a note at his house.

MDCH staff made another visit to the field where the boys claimed to have left the mercury in the abandoned vehicle. There were approximately 2 grams of mercury visible in the wrecked van, not enough of the element, nor in a confined space to accumulate vapor concentrations, that would constitute a hazard. However, someone could have taken the mercury elsewhere and had an indoor spill. After leaving the field, the MDCH staff phoned the SCHD and requested that they capture as much of the mercury as possible at the wrecked van to keep others from taking it.

The SCHD contacted MDCH the following day and requested help in following up on the missing mercury. MDCH drafted a press release that included an appeal for the return of the mercury (Appendix A). SCHD issued the press release, and soon afterwards a citizen contacted them to say he had found the mercury in the van and taken it to his home. He made arrangements with the department and dropped off more than 5 pounds of mercury.

Discussion

Environmental Contamination

The primary pieces of equipment used by MDCH staff when called upon to investigate a mercury release are a handheld spotlight, for conducting visual inspections, and an Ohio-Lumex RA915+ real-time mercury-vapor analyzer (detection limit: ± 2 ng/m^3; accuracy ± 20%). The portability, repeatability, and sensitivity of the RA915+ make it an excellent tool for determining the extent of a mercury release.

There was no significant amount of mercury vapors detected at the high school. As a courtesy to the school, MDCH personnel also checked the chemistry classroom and storage closet. The glass, corked bottle of elemental mercury seemed to have an incomplete seal, as concentrations near the cork in the opening of the bottle were higher than the surrounding air.

Two of the three students' homes had minimal detections of mercury in the air, on clothing, or on furniture. In the third student's house, the vacuum cleaner showed elevated concentrations, with the bag of the appliance registering 3,000 to 6,000 ng. One 10-second average reading for the bag was 6,052 ng. The drain to the sink in the bathroom adjacent to the boy's bedroom registered readings of 300 to 600 ng. When the trap to the sink was removed, agency personnel found beads of mercury in the trap. Clothing, carpeting, and furniture in this house showed minimal detections on the Lumex. Subsequent to the initial testing in this house, MDCH learned that the student had removed some mercury from a vial in his bedroom to show a younger child who was visiting. He spilled the mercury onto his bed, deposited what he could gather up by hand down the bathroom sink, and vacuumed the bedspread. Follow-up testing in the home did not detect any portions of the bedroom carpet above 100 ng/m^3 but did find a single

small bead on the face of the dresser in the room. It was surprising to find that the boy's attempt to clean up the spill had been as successful as testing indicated.

Toxicological Evaluation

The main routes of exposure for elemental mercury are ingestion, dermal absorption and inhalation of mercury vapors. Of the three, inhalation is the most hazardous route, particularly to children and women of childbearing age. Inhalation of high levels of elemental mercury can cause permanent neurological damage and kidney impairment (ATSDR 1999).

The Agency for Toxic Substances and Disease Registry (ATSDR) recommends that breathing zone mercury levels not exceed 1,000 ng/m^3 for long-term exposures, such as in a residence. This is an action level that, if exceeded, would prompt the need for further cleanup or other remedial action. This recommended level is based on both animal studies and human epidemiology studies that describe the health effects of inhalation of mercury-contaminated air (ATSDR 1999, 2000).

In the Durand Mercury Incident, investigators were most concerned about indoor residential exposure. Though exposure may have happened in the home where the mercury was spilled, MDCH investigators do not believe anyone was exposed for more than a very short period, perhaps a few hours at most, to concentrations of mercury that could result in health effects. However, continued exposure could have resulted in negative health consequences, making it imperative that the vials of mercury from the van be recovered.

Addressing the Unique Vulnerabilities of Children

Children may be at greater risk than adults from certain kinds of exposure to hazardous substances at sites of environmental contamination. They engage in activities such as playing outdoors and hand-to-mouth behaviors that increase their exposure to hazardous substances. They are shorter than adults, which means they breathe dust, soil, and vapors close to the ground. Their lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. The developing body systems of children can sustain permanent damage if toxic exposures are high enough during critical growth stages (ATSDR 1998).

Children who breathe metallic mercury vapors may develop a disorder known as acrodynia, or "pinks disease." The symptoms of this disorder include severe leg cramps, irritability; and abnormal redness of the skin, followed by peeling of the skin of the hands, nose, and soles of the feet. Itching, swelling, fever, fast heart rate, elevated blood pressure, excessive salivation or sweating, rashes, fretfulness, sleeplessness, and/or weakness may also be present. This disorder may also occur in teenagers and adults. Exposure to mercury vapors is more dangerous for children than for adults, because inhaled mercury vapors easily pass into the brain and nervous system of young children and may interfere with the development process. Exposure to high levels of mercury vapor can also cause lung, stomach, and intestinal damage. Death due to respiratory failure can result in cases of extreme exposures (ATSDR 1999).

As stated previously, it is not likely that the exposure that had occurred prior to intervention by health officials would have caused health effects, but continued exposure could have had negative consequences. The students directly involved in the elemental mercury release in Durand were all in their mid-teens. The child to whom the one student wanted to show the mercury, but ended up spilling it on his bed, was a pre-teenager. These adolescents were still physiologically immature and could have been exposed to harmful levels of mercury vapors. Younger members of the immediate or extended family could have been exposed to harmful levels of mercury in the home where the spill occurred. None of the mothers of the boys involved was known to be pregnant at the time. MDCH approached the investigation with concerns for the boys involved in the event while also seeking to prevent others from being exposed to mercury from the same source. If other children played in the private dump and found any other containers of mercury, then they would potentially be at risk as were children playing in the abandoned car.

Community Health Concerns

The parents of the children were concerned for the boys' health and that of young family members, classmates, and friends. There was also concern in the community for the potential loss of household furnishings and property within the school. Though it was unlikely that the boys would have been exposed long enough to be affected, several of boys' parents asked for details about biological testing for them. MDCH subsequently learned that the boy who had taken the mercury home had a blood test, the results of which were non-detect for mercury.

Conclusions

At the time of MDCH's involvement in the investigation, the amount of mercury unaccounted for constituted a public health hazard. If several pounds of mercury were spilled and tracked in the school, in a vehicle like a school bus, or in a residence, and left unreported, a great number of people could have become ill from chronic exposure to mercury vapors. If any of the mercury were spilled near a heat source in an enclosed setting, the exposure could have produced acute health effects. Until the vials were recovered and any contaminated materials addressed, this mercury release would have remained a public health hazard. Now that the mercury has been recovered, no current public health hazard exists.

Recommendations

The following recommendations were made at the time of the MDCH activities:

1. The source of the mercury and anywhere the mercury was carried afterward should be determined, and all of the vials of mercury should be recovered.
2. The owner of the private property containing the abandoned vehicles and scrap materials should be contacted and asked to inventory his property for other hazardous materials and physical hazards to dispose of, or secure them, as necessary.

3. The school should communicate to all the students' parents information about the mercury event and direct health concerns or questions from the parents or their physicians to MDCH.
4. The Shiawassee County Health Department should issue a press release that raises people's awareness of the hazards of mercury and encourages community help in locating and securing the missing mercury.

Public Health Action Plan

All of the recommended activities listed above were implemented soon after they were identified, making no further activities necessary at this time.

If any citizen has additional information or health concerns regarding this health consultation, please contact the Michigan Department of Community Health, Environmental and Occupational Epidemiology Division, at 1-800-648-6942.

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References

ATSDR (Agency for Toxic Substances and Disease Registry). 1998. ATSDR, Division of Health Assessment and Consultation. Guidance on Including Child Health Issues in Division of Health Assessment and Consultation Documents. July 2, 1998.

ATSDR. 1999. Toxicological Profile for Mercury, Update.

ATSDR. 2000. Suggested Action Levels for Indoor Mercury Vapors in Homes or Businesses with Indoor Gas Regulators.

Photo 1. Junked commercial van where several vials of mercury were found, Durand, Michigan

Photo 2. Contents of junked van where several vials of mercury were found, Durand, Michigan

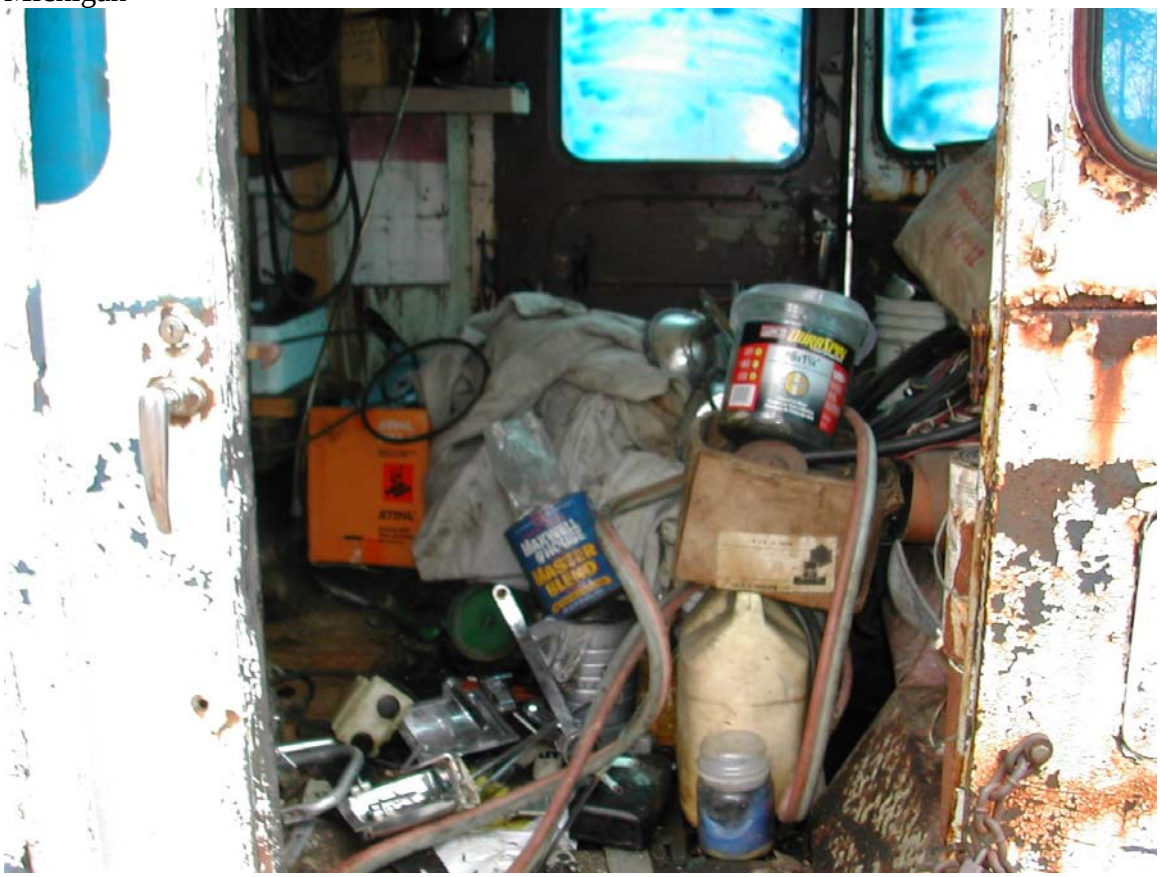

Photo 3. Abandoned van in “Tylers Field” where mercury was brought, Durand, Michigan

Photo 4. Interior of abandoned van where mercury was brought, showing area where beads were seen, Durand, Michigan.

Appendix A: Press Release Issued by Shiawassee County Health Department Regarding Missing Vials of Mercury

MERCURY MISSING- SHIAWASSEE COUNTY

"A substantial amount of elemental mercury, found in an abandoned delivery van, is still missing in the community," Shiawassee County health officials announced today. Three high school boys from the Durand area came upon bottles of the heavy silver-colored element stored in a vehicle on private property near Lehring and Reed Roads, Burns Township, about three weeks ago. One of the boys took some of the mercury home; the rest of it was taken to the site of a wrecked blue van in the southeast corner of a field known as "Tylers Field" off Pittsburgh and Reeds Roads, Vernon Township. They spilled some there and placed the rest in a container inside the wrecked van for storage. One of the boys returned later and found it was missing.

Mercury vapors that rise from the silvery material when it is out of a container are very toxic especially to children and pregnant women. Exposure to mercury vapors can cause damage to the brain and central nervous system as well as to the kidneys. Severe damage is hard to correct even after a person is treated for mercury poisoning.

State and county health officials visited Durand on Monday and Tuesday of this week to test the high school and several private homes and vehicles. They join the Shiawassee County Health Department in urging anyone who has the mercury, or knows where it is now located, to contact Gene Paez (743-2391) from the local health department. Division Sanitarians will collect and dispose of the mercury in a safe manner. "We are not interested in anyone getting in trouble over this", said Environmental Health Director Paez, "but we are interested in preventing anyone from getting seriously ill or from being forced to leave their home." For additional information about mercury and the medical tests needed after exposure, call the Michigan Department of Community Health at 1-800-648-6942.

Further, Shiawassee County will be conducting their 2nd ***Household Hazardous Waste Collection on November 9, 2002 on Chippewa Trail, behind VG's grocery store, in Owosso Twp. From 8 am to 12 pm (no appointment is needed).*** "This incident points out the need for all residents in Shiawassee county to clean out their garages, storage sheds, basements, and under kitchen sinks, to make sure hazardous materials are properly handled and disposed of. Hopefully, no one will be hurt from this incident," Paez said.

Certification

This Durand Mercury Incident Health Consultation was prepared by the Michigan Department of Community Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

Technical Project Officer, State Programs Section, Superfund Site Assessment Branch, Division of Health Assessment and Consultation, ATSDR

The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

Chief, State Programs Section, Superfund Site Assessment Branch, Division of Health Assessment and Consultation, ATSDR